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Lists of Species

Herpetofauna of the Reserva Extrativista do Rio Gregório, Juruá Basin, southwest Amazonia, Brazil

Davi Lima Pantoja [1*] and Rafael de Fraga [2]

1 Universidade de Brasília, Programa de Pós-Graduação em Ecologia. CEP 70910-900. Brasília, DF, Brazil.
2 Instituto Nacional de Pesquisas da Amazônia, Coordenação de Pesquisas em Ecologia. Av. Efigênio Salles, 2235. CEP 69060-020, Manaus, AM, Brazil.
* Corresponding author. E-mail: *pantoja.davi@gmail.com*

Abstract: We present a checklist for reptiles and amphibians of the Reserva Extrativista do Rio Gregório, at the upper Juruá River basin, in the southwest Brazilian Amazonia. Using time-constrained searches, pitfall traps, vocalization, and accidental sightings, we recorded 84 species: 46 amphibians and 38 reptiles. Although analyses suggest still higher diversity, considering the short sampling time, relatively high species richness was documented, which reveals the relevance of this region for conservation. Species richness did not differ between upland and floodplain habitats. Species compositions were significant different between these habitat categories for amphibians and snakes, but not for lizards, suggesting some habitat preferences. Additionally, we found threatened and vulnerable species. We did not assess impacts of human activities on natural populations in RESEX do Rio Gregório, but since resident people have directly used natural resources (e.g. consuming turtles and modifying natural habitats), we recommend monitoring biodiversity to avoid negative impacts.

Introduction

Species richness and composition are the most basic parameters used in describing biological communities, and important ecological theories have been developed based mainly on the number of species (*e.g.* MacArthur and Wilson 1963). Moreover, most diversity indices are richness-dependent and generally interrelated; therefore, although observed richness is not completely bias free (Beck and Schwanghart 2010) species richness is a convenient measure to contrast diversity among areas (Schluter and Ricklefs 1993). Therefore, accessing these attributes of biological communities helps guide decision-making for conservation initiatives and supports the construction of management plans for protected areas.

The Amazonia is the largest tropical rainforest in the world, extremely species rich (Mittermeier *et al.* 2003). The Brazilian Amazonia houses about 232 amphibian species, 94 lizards, 10 amphisbaenians, 149 snakes, 16 turtles, and four alligators (Avila-Pires *et al.* 2007). However, the known species richness is clearly underestimated, because new species are continuously described throughout the Amazon basin (*e.g.*, Elmer and Cannatella 2008; Guayasamin *et al.* 2006; Miralles *et al.* 2006; Prudente and Passos 2010; Santos *et al.* 2008; Sturaro and Avila-Pires 2011). Likewise, we have limited knowledge about local and regional richness. For most species, geographical ranges are poorly known (see da Silva and Sites 1995; Vogt *et al.* 2001; Avila-Pires *et al.* 2009). Although some Amazonian regions have received attention (*e.g.* Central Amazonas, see Martins and Oliveira 1998; Lima *et al.* 2006; Vitt *et al.* 2008; Ilha and Dixo 2010), many others remain unsurveyed (Azevedo-Ramos and Galatti 2001), especially in the most remote areas such as western Brazilian Amazonia (Azevedo-Ramos and Galatti 2002; França and Venâncio 2010). Nevertheless, large areas are under an accelerated process of deforestation (Fearnside and Barbosa 2004; Fearnside 2005), which contributes enormously to species extinctions (Wilson 1997). Habitat loss through conversion of natural environments appears to be among the highest threats to biodiversity (Bruner *et al.* 2001).

Former studies have sought to map areas with the largest knowledge gaps and under the greatest threats, suggesting priority areas for conservation of Amazonian herpetofauna (Azevedo-Ramos and Galatti 2001; Vogt *et al.* 2001). Currently, creating protected areas is the most common emergency strategy for species and ecosystems conservation (Bruner *et al.* 2001; Balmford *et al.* 2002; Rodrigues *et al.* 2004; Garda *et al.* 2010), with great potential to protect the herpetofauna (da Silva and Sites 1995; Rodrigues 2005). Thus, overlapping those areas and listed priorities, coupled with efforts to survey unknown areas, have been stressed by experts as essential strategic actions in the implementation of conservation policies (Azevedo-Ramos and Galatti 2002). Compilation of accurate species lists and associated biogeographical data are the starting points for effective conservation planning (Nogueira *et al.* 2009b). In this context, we studied the species richness and composition of reptiles and amphibians in different physiognomies and environments of the Reserva Extrativista do Rio Gregório (RESEX do Rio Gregório), a protected area for sustainable use at the Juruá River Basin, a remote and poorly known region in Amazonia. As part of a larger study with reports for other biological groups, this research seeks to record baseline information on local biodiversity, in order to act as a framework for the management plan and to guide decision making in RESEX do Rio Gregório.

Materials and Methods

Study site

Extractive reserves, as defined by Brazilian law,

are protected areas whose rationale is to sustainably match direct anthropogenic use of natural resources and biodiversity conservation, so that biodiversity will not be lost for future generations. The use of this sustainable approach is a fundamental practice for natural environment protection, as well as the livelihood and culture of traditional residents (riverine people), who remain extractive as collectors, fishermen and hunters (AMAZONAS 2007).

The RESEX do Rio Gregório is an extractive reserve located in the municipalities of Eirunepé and Ipixuna, southwest Amazonas state (AM), northern Brazil (Figure 1). It has a central position in the Gregório River Basin, a right-bank tributary of the upper Juruá River, with 3,052.68 km^2. To the north, the Coatá Stream and the Kulina indigenous land delimit the reserve. The southern edge is bounded by the political border of Acre state (AC), demarcated by two other protected areas: the Floresta Estadual do Mogno and the Floresta Estadual do Rio Gregório, also included in the direct/sustainable-use categories of protected areas by the Brazilian legislation. The watershed between the basins of the Gregório River and Eirú River delimits the eastern border, and finally, the western border is defined by the watershed between the basins of the Gregório River and other smaller tributaries of the Juruá River.

The general topography of the region is typical of Amazon lowlands, with lowland covered by dark red-podzolic soils (53.6%), cambisols (36.6%) and alluvial soils (9.8%). The reserve climate varies in a southeast-northwest direction: in the southeast, there is at least a two-month dry season, and in the northwest, it rains throughout the year (AMAZONAS, 2010). Rainfall is quite high, 2,250 to 2,750 mm per year. Average temperature (24 to 26°C) and relative humidity (90 to 95%) vary little throughout the year. The predominant vegetation is open lowland rainforest, but there is also upland rainforest (*Terra Firme*), dense lowland rainforest, flooded forest with palm trees (buritizais), and secondary forest near riverine communities (for detailed information, see the management plan of RESEX do Rio Gregório, available in http://www.ceuc.sds.am.gov.br).

Large portions of the upper Juruá River are well preserved but poorly understood; the area also houses many riverine communities and indigenous residents. Experts signaled the lower Gregório River as one of the priorities for Amazonian herpetofauna conservation

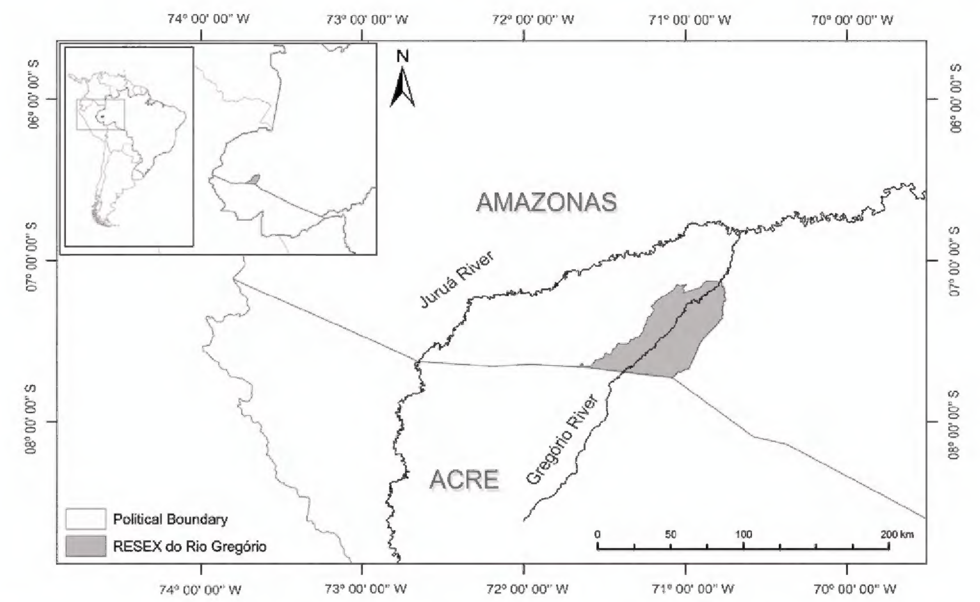

Figure 1. Study site, Reserva Extrativista do Rio Gregório, a protected area in Amazonas state, southwest Amazonia, Brazil.

(Capobianco *et al.* 2001), classifying it as "area of extreme importance". In addition, the western region has been recognized as one of the richest Amazonian regions, supported by a region-wide edaphic mosaic, primarily as a consequence of the Andean uplift and its substrate supplies (Hoorn *et al.* 2010). This mega-diverse region has become rapidly colonized by humans but remains poorly understood scientifically. The RESEX do Rio Gregório was legally created by the state decree number 26,586 of April 25, 2007 as part of the Amazonas state system of protected areas (SEUC) and is managed by the Centro Estadual de Unidades de Conservação, a governmental agency.

Data collection

Sampling was carried out during the transition between the wet and dry seasons, from 07 to 21 April 2009 using the following methods:

A) Pitfall traps with drift fences, PT (*sensu* Cechin and Martins 2000) – We used eight 10-bucket lines, equally divided between two sampling points. In each sampling point the buckets were buried eight meters apart from each other, arranged in approximately straight lines; distance between the lines ranged from 300 to 350 m, with two lines composed of 18-liter buckets and two lines alternating 18 and 60-liter buckets. We placed half of the lines in upland forest (*Terra Firme*) and half in lowland/floodplain forests (*Várzea*). In addition, a 0.5 m high plastic drift fence connected the buckets in each line. Data collection from these traps took place four consecutive days at each point. Our sampling effort was 40 buckets and 288 m of drift fences per day, during eight days (or [320 buckets + 2,304 m]•day).

B) Time-constrained search, TCS (*sensu* Crump and Scott - Jr. 1994) – We devoted three hours daily to this method, and different vegetation types (upland forest, lowland/floodplain, *igapó* (black water flooded forest), bamboo lowland-forest, margins of streams, *capoeira* (secondary forest), and anthropic/disturbed areas) were sampled. We used existing trails usually utilized by native hunters and rubber tappers, totaling 72 hours•person. We conducted these active-searches during day and night, but mainly at night, and mostly on foot, but also by boat when in flooded areas.

C) Vocalizations – This complementary method allowed for species records based on frog calls.

D) Accidental sightings – We also collected specimens randomly found.

E) Cooperation – Some specimens were collected by members of other thematic teams, working out their samples in the study area independently, but simultaneously.

We collected specimens under official license (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA) / Sistema de Autorização e Informação em Biodiversidade – SISBIO permit nº 14032/518309) and deposited them in the herpetological collection of Instituto Nacional de Pesquisas da Amazônia – INPA (Manaus, AM, Brazil).

Data analysis

Sample-based accumulation curves were constructed for amphibians and reptiles, by rarefaction using the Mao

Tau index (Colwell *et al.* 2004), applied on abundance per species data, using records in time-constrained search sessions plus pitfall traps. Analyses were performed in the freeware EstimateS 8.20 (Colwell 2009).

We ran ANOVA two-factor models separately for amphibians, lizards, and snakes to test difference in species richness between upland and floodplain habitats. Because anthropic-disturbed areas were small, very close to the edges of forest and not seasonally flooded, species recorded in this habitat were included in the "upland" category. We then considered two habitat categories: floodplain habitats (flooded forest, *igapó* forest, margin of river, margin of stream, and river channel), and upland habitats (anthropogenic areas, and upland forest).

Dissimilarities were calculated using Bray-Curtis index to determine the variation in species composition between habitats (upland and floodplain). Dimensionalities were reduced by Nonmetric Multidimensional Scaling (NMDS) models independently for amphibians, lizards, and snakes based on a matrix of species abundance. Contrasts in species composition were displayed in two-dimensional graphics (Legendre and Legendre 1998), with points designated by habitat type where each species was found. These models were run only for those species recorded in time-constrained searches and pitfall traps, because collecting efforts using other methods were not standardized. Multivariate analysis was performed using R v2.13.0 (R Development Core Team 2010).

We considered scores produced by the first NMDS axis as factors to quantify the variation in species composition (Bray-Curtis applied on abundance per species matrices), and we tested differences between upland and floodplain habitats using ANOVA two-factor models, separately for amphibians, lizards and snakes. Boids *Boa constrictor* and *Eunectes murinus* were not included in these models, because they were recorded only through cooperation, and we have no accurate data on the habitats in which they were found.

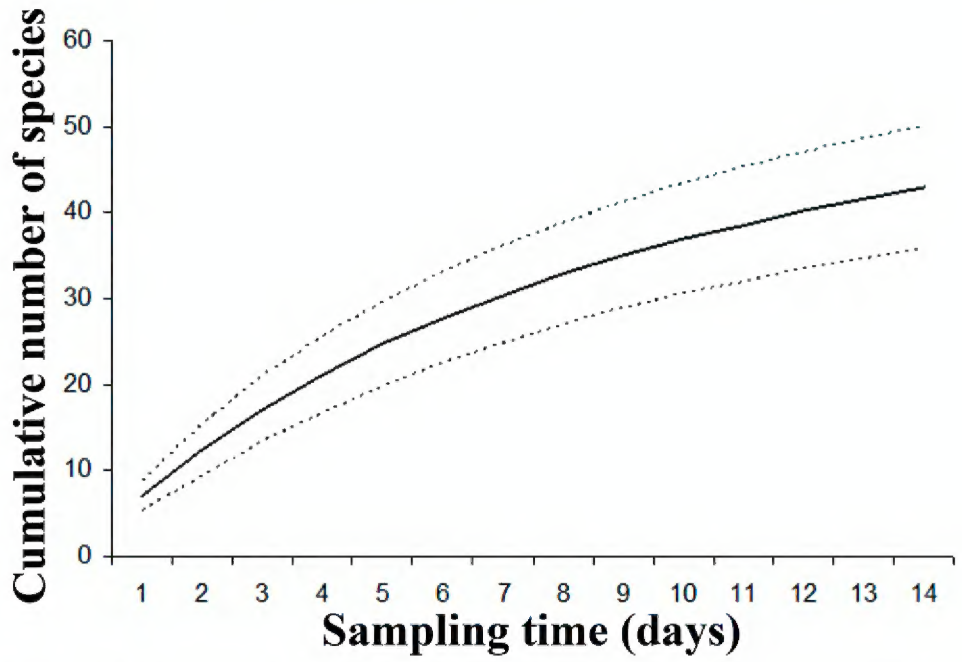

Figure 2. Sample-based species rarefaction curves for amphibian records in the Reserva Extrativista do Rio Gregório. Line represents the rarefied number of species per day, and dots are the correspondent standard errors.

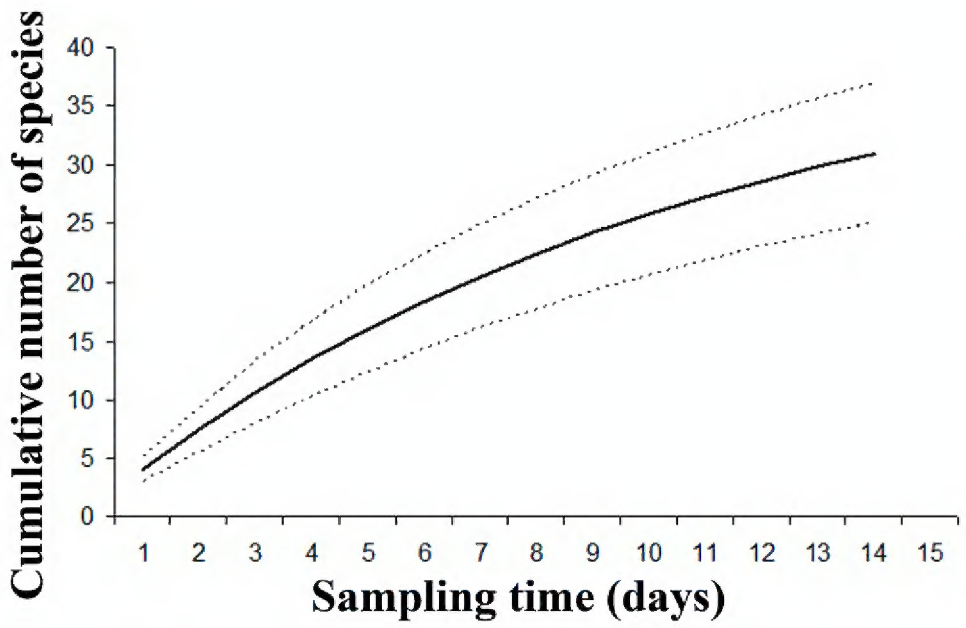

Figure 3. Sample-based species rarefaction curves for reptile records in the Reserva Extrativista do Rio Gregório. Line represents the rarefied number of species per day, and dots are the correspondent standard errors.

Results and Discussion

Sampling

We recorded 84 species: 45 frogs (Anura), and one caecilian (Gymnophiona); one amphisbaenia (Amphisbaenidae), 15 lizards, and 18 snakes (Squamata); two alligators (Crocodylia); and two turtles (Testudines) (Table 1; Appendix 1-4). Rarefaction curves did not stabilize for neither amphibians (Figure 2) nor reptiles (Figure 3), which indicates that additional sampling efforts will add significant number of species for all groups surveyed. Anura had the highest observed species richness, followed by snakes and lizards. This is expected for amphibians since they are usually abundant, relatively easy to find, and because the Juruá Basin is known to house a rich and diverse frog fauna (Azevedo-Ramos and Galatti 2002; Souza 2009; Bernarde *et al.* 2011a). Moreover, considering the short sampling time, we recorded a relatively high number of snake species. However, rapid surveys like ours are usually not sufficient to adequately estimate species richness, especially for cryptic or low-detectable organisms, such as snakes.

Among amphibians, not surprisingly the most representative family was Hylidae (21 species), followed by Leptodactylidae and Strabomantidae (five species each), Bufonidae, Dendrobatidae, and Microhylidae (three), Leiuperidae (two), Aromobatidae, Ceratophryidae, and Pipidae (one). Hylidae, consisting mostly of treefrogs, is the most diversified amphibian family in Brazil (SBH 2010). The most representative lizard families were Polychrotidae and Gymnophthalmidae (four), followed by Sphaerodactylidae (three), Teiidae (two), Iguanidae, and Tropiduridae (one). The most representative family of snakes was Dipsadidae (seven), followed by Boidae, Elapidae, and Viperidae (three), and Colubridae (two).

The number of species recorded exclusively by pitfall traps accounted for 19% of total sample (N=16, Appendix 4), mainly represented by small leaf-litter frogs (*e.g. Allobates* sp., *Edalorhina perezi*, *Engystomops freibergi*, *Leptodactylus hylaedactylus*, *Chiasmocleis bassleri*, *C. ventrimaculata*, and *Hamptoprhyne boliviana*), and terrestrial lizards (*e.g. Alopoglossus angulatus*, *Arthrosaura reticulata*, *Bachia peruana*, *B. flavescens*, and *Pseudogonatodes* sp.). Most of these species have secretive habits, and their high camouflage capacity makes them less detectable by active search on a regular basis. Thus, the use of this method increases access to species composition (qualitative feature), and should be used even in rapid assessments and inventories. Although pitfall traps are not used to focus on aquatic species, we recorded *Pipa pipa* (an aquatic frog) using this method, which was possible by

flooding caused by rain during sampling. The genus *Pipa* has been recorded before in a similar situation (Garda *et al.* 2006).

Species richness

Based on the short-term sampling, our results indicate high alpha-diversity in the Reserva Extrativista do Rio Gregório. This is especially true for amphibians, since we recorded 46 species *versus* 35 in Santarém, 41 in the Floresta Nacional de Caxiuanã, and 47 in Carajás, Pará (PA), 45 in Roraima (RR), 53 species along Madeira River, and 56 in Guajará-Mirim, Rondônia (RO) (Gordo 2003, and its citations), 43 for lower Purus / Solimões Rivers, 50 in Reserva Adolpho Ducke (Lima *et al.* 2006). The RESEX do Rio Gregório's high amphibian species diversity is even more noticeable considering our 14-day sampling effort, whereas sampling at the Reserva Adolpho Ducke, in Manaus, AM, occurred over a period of 20-plus years (Lima *et al.* 2006). França and Venâncio (2010) also used rapid sampling and recorded 59 species of amphibians in Boca do Acre, southwest of Amazonas state, but they conducted surveys during both dry and rainy seasons. Thus, greater sampling efforts may place the Gregório River basin among the areas of highest richness of amphibians in the Brazilian Amazonia. The high richness pattern at western Amazonia has already been stressed in evolutionary/historical approaches considering the whole Neotropical region (Hoorn *et al.* 2010; Santos *et al.* 2009).

The richness of lizards (15 species) is probably under-sampled in this study, especially considering local richness levels reported by previous studies. For instance, in southwest Amazonia 19 species were surveyed in Boca do Acre, AM (França and Venâncio 2010); 28 in Espigão do Oeste, RO (Macedo *et al.* 2008); 29 in Reserva Extrativista Riozinho da Liberdade, AC (Bernarde *et al*. 2011); 29 in Porto Walter, AC (Avila-Pires *et al.* 2009). In central Amazonia 35 species are known to live in the Reserva Adolpho Ducke (Vitt *et al.* 2008). In this study we did not record some expected genera probably due to insufficient trapping time, including Gymnophthalmidae cryptozoic lizards (*e.g. Leposoma* and *Iphisa*), usually caught only in pitfall traps. Likewise, *Tupinambis* (Teiidae) and *Plica plica* (Tropiduridae) occur in several Amazonian localities, but were not recorded. Therefore, further inventories are needed to access lizard richness in the RESEX do Rio Gregório.

Snakes are a very species-rich group within Amazonian Squamata. However, rapid sampling methods are often inefficient means of access to snake fauna. All of the Amazonian studies showing high local richness were conducted over the long term, involved large research teams, and included supplemental data supported by scientific collections. Some examples are: 56 species for Espigão do Oeste, RO (Bernarde and Abe 2006), 66 species for the region of Manaus, AM (Martins and Oliveira 1998), 69 in Floresta Nacional de Caxiuanã, PA (Prudente and Santos-Costa 2005), and 86 for eastern PA (Cunha and Nascimento 1993). Regardless, the relationship between sampling effort and species richness obtained for Gregório River is remarkable. Eighteen species in 14 days comprises a sampling rate of 1.23 species per day, which can be considered high, especially because snakes are cryptic animals, many species are hardly detected by visual search, and most adult specimens can avoid or escape pitfalls.

Unsurprisingly, alligators, turtles, amphisbaenians, and caecilians had the lowest species richness, as in most inventories in Amazonia. Turtles and alligators are eventually more abundant than other Amazonian herps, but both are actually the least diverse groups in the Brazilian Amazonia (Vogt *et al.* 2001). Only four species of alligators are currently known in the Brazilian Amazonia, two of them (*Paleosuchus palpebrosus* and *P. trigonatus*) are small sized and restricted to smaller streams (Rueda-Almonacid *et al.* 2007). Amphisbaenians and Caecilians have secretive habits, spending most of their lives in underground tunnels and in the litter interface. These features are major obstacles in surveying these groups, which require specific methods that we did not implement (*e.g.* excavation, specialized traps for turtles, etc.). Therefore, the sampling method partially explains the low diversity found for these groups, most of them still under-sampled.

Habitats

Considering only records based on standard methods (TCS + PT), we recorded twenty-six species in each category of habitat. Species richness did not differ between upland and floodplain habitats, for amphibians (ANOVA $F_{1,26}$ = 1.483, P = 0.23), lizards (ANOVA $F_{1,26}$ = 1.44, P = 0.24) and snakes (ANOVA $F_{1,26}$ = 1.56, P = 0.23). Upland habitats have been pointed as usually richer in species of amphibians, as compared to flooded-lowland habitats (Gordo 2003). For reptiles, however, information on patterns of species richness is very scarce. Availability of information about Amazonian floodplain's herps is quite limited. Finer scales, such as ecological gradients, are better suited to determine patterns of habitat use because they contain more information about the local landscape factors that may affect species (Fraga *et al.* 2011). However, this approach demands time and funds that were not available for this study. Therefore, we chose a discrete scale, useful for a quick sampling approach.

Although species richness did not differ significantly between upland and floodplain habitats, we found some significant differences in species composition between these habitat categories. Twenty species of amphibians, four lizards and two snakes were recorded exclusively in upland habitats, whereas 15 amphibians, three lizards and eight snakes were recorded exclusively in floodplain habitats. On the other hand, four amphibians, six lizards and one snake shared both habitats (Table 1 and Figure 4). Additionally, we used the variation between scores produced by the first NMDS axis, and we found significant differences in species composition between upland and floodplain habitats for amphibians (ANOVA $F_{1,33}$ = 16.52, P = 0.0002), and snakes (ANOVA $F_{1,8}$ = 11.12, P = 0.01), but not for lizards (ANOVA $F_{1,5}$ = 0.192, P = 0.68). The number of exclusive species and significant differences in species composition suggest some habitat preferences among herps in the RESEX do Rio Gregório, although less evident among lizards. Upland and floodplain forests are quite different considering physical structure, especially due to vegetation types and influence of water bodies. Spatial organization of herpetofauna communities may be

correlated with local features of the landscape, as has been demonstrated for amphibians (Menin *et al.* 2007), lizards (Nogueira *et al.* 2009a; Vitt *et al.* 2007) and snakes (Fraga *et al.* 2011). Although the two NMDS axes captured 42% of variation in species composition for amphibians (Figure 4A), 54% for lizards (Figure 4B) and 66% for snakes (Figure 4C), the spatial distribution of species along two NMDS axis (Bray-Curtis matrix) showed no clear species clusters based on habitat categories. The absence of clear clusters, and significant differences for lizards suggest random distribution of species across the landscape, or predominance of habitat-generalist species in the studied assemblage. The short sampling time or rough habitats categorization used prevents us from drawing strong conclusions on species use of habitats. Possibly, the scale at which we defined habitat is not compatible with the scale at which species use the available habitats. Indeed, habitat preference responds to a combination of contemporary/local factors and historical/evolutionary constraints acting on species ecology (Losos 1996).

The relatively high number of species recorded near human habitation (22) may reflect sampling effort bias, but also suggests the presence of resilient species for both reptiles and amphibians. Some species potentially have adaptations that enable them to resist some anthropogenic environmental changes, although they are expected to occupy clearings and edges of undisturbed not seasonally flooded forests (*e.g. Leptodactylus hylaedactylus* and *Scinax ruber*). Typical examples are species that benefited from the increase of solar radiation coming from deforestation and human presence (Vitt and Colli 1994), like heliothermic lizard *Ameiva ameiva*, commonly observed in anthropic areas (Sartorius *et al.* 1999; Avila-Pires 2005).

General comments

A high number of species is expected in southwest Amazonia, which also has a high potential to present undescribed species. Six species were identified to the level of genus only. Further studies should reveal their precise identification, potentially recognizing undescribed species. For instance, the South American leaf-toads *Rhinella margaritifera* belong to a species complex for which currently there are no morphological parameters for safe taxonomic identification. Most species we found are assumed to have wide distribution in Amazonia, however some species are rarely recorded, and their range and ecology are barely known. The arboreal pitviper *Bothriopsis bilineata* is usually rare in samples, and few studies have reported records (*e.g.* Bernarde *et al.* 2011b), possibly because it occurs in low densities over a large area. However, it was considered relatively abundant in the Moa River, Cruzeiro do Sul, AC (Turci *et al.* 2009). In addition, we present the first records of *Ameerega macero* (Dendrobatidae) and *Liophis dorsocorallinus* (Dipsadidae) for the Amazonas state. Recent occurrences of these species in Brazil were restricted to the Acre state (*e.g.* Bernarde *et al.* 2011; França and Venâncio 2010). Our records supply complementary data to understand habitat use and geographical distribution of several species of Amazonian amphibians and reptiles.

We did not record any species listed in the Brazilian list of species threatened by extinction (Machado *et al.* 2008). However, the black caiman *Melanosuchus niger* and the yellow-spotted river turtle *Podocnemis unifilis* are regionally threatened throughout Amazonia (Rueda-Almonacid *et al.* 2007). Both species are listed in the IUCN Red List of Threatened Species (version 2.3) as lower risk and vulnerable, respectively (IUCN 2011). Among our records, all Testudines (*Chelonoidis* sp., and *Podocnemis unifilis*), Crocodylia (*Caiman crocodilus*, and *Melanosuchus niger*), Boidae snakes (*Boa constrictor*, *Corallus hortulanus*, and *Eunectes murinus*), and the Iguanidae lizard (*Iguana iguana*) are listed in the CITES Appendix II (CITES 2011). This Appendix makes reference to those species that could be threatened with extinction soon if trade is not closely controlled. In addition, different species occurred in upland and flooded forests, highlighting the importance to preserve different habitats, which should be considered when zoning the reserve. We did not assess impacts of hunting or any other human activities on biological populations in RESEX do Rio Gregório, however resident people directly use the natural resources in several ways. They promote conversion of natural habitats, and regularly consume turtles and their eggs. Monitoring biodiversity and the use of natural resources within this protected area should avoid negative impacts on its herpetofauna.

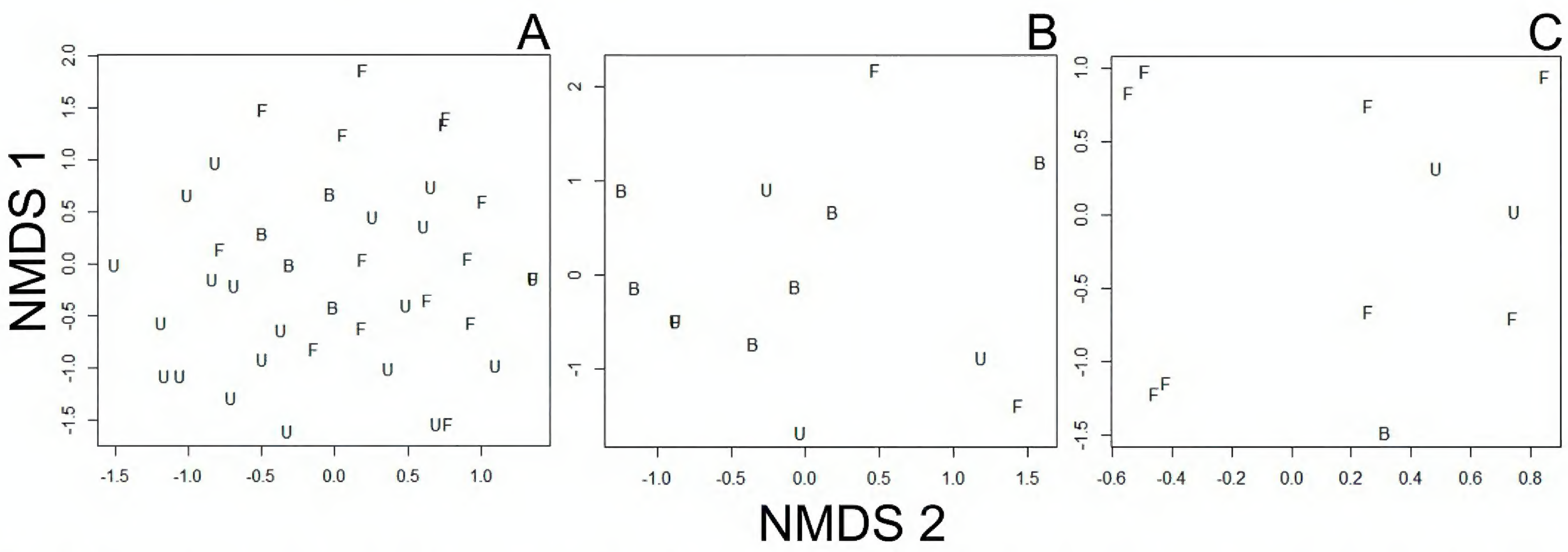

FIGURE 4. Dissimilarities in species composition in different habitats at the RESEX do Rio Gregório summarized in two Nonmetric Multidimensional Scaling (NMDS) axes for A – amphibians, B – lizards and C – snakes. F = flooded habitats; U = upland habitats; and B = both habitats.

Table 1. Species Checklist. Herpetofauna of Reserva Extrativista do Rio Gregório, southwest Amazonia, Brazil. Habitats: A= anthropogenic; FF= flooded forest; IG= igapó forest; MR= margin of river; MS = margin of stream; RC = river channel; UF = upland forest. Methods: AS = accidental sighting; CO = cooperation; PT = pitfall trap; TCS = time-constrained search; VO = vocalization.

	TAXON	HABITAT	METHOD	N
	Amphibia			
	Anura			
	Aromobatidae			
1-	*Allobates* sp.	UF	PT	6
	Bufonidae			
2-	*Rhaebo guttatus* Schneider, 1799	A	CO	1
3-	*Rhinella margaritifera* (Laurenti, 1768)	A / FF / MS / UF	CO / PT / TCS / VO	34
4-	*Rhinella marina* (Linnaeus, 1758)	A	CO / TCS /VO	4
	Ceratophryidae			
5-	*Ceratophrys cornuta* (Linnaeus, 1758)	FF / UF	CO / TCS	3
	Dendrobatidae			
6-	*Ameerega hahneli* (Boulenger, 1884)	FF	AS / PT	5
7-	*Ameerega macero* (Rodriguez and Myers, 1993)	UF	CO	-
8-	*Ameerega trivittata* (Spix, 1824)	UF	AS	1
	Hylidae			
9-	*Dendropsophus brevifrons* (Duellman and Crump, 1974)	FF	TCS	2
10-	*Dendropsophus leucophyllatus* (Beireis, 1783)	A	TCS / VO	2
11-	*Dendropsophus parviceps* (Boulenger, 1882)	FF	TCS / VO	2
12-	*Dendropsophus minutus* (Peters, 1872)	FF	TCS / VO	5
13-	*Hypsiboas boans* (Linnaeus, 1758)	FF	TCS	2
14-	*Hypsiboas calcaratus* (Troschel, 1848)	FF	TCS / VO	2
15-	*Hypsiboas cinereascens* (Boulenger, 1882)	FF	VO	-
16-	*Hypsiboas fasciatus* (Günther, 1859)	FF	TCS	4
17-	*Hypsiboas geographicus* (Spix, 1824)	FF	TCS / VO	6
18-	*Hypsiboas lanciformis* (Cope, 1871)	A	TCS / VO	4
19-	*Hypsiboas punctatus* (Schneider, 1799)	A	TCS / VO	1
20-	*Hypsiboas wavrini* (Parker, 1936)	FF	TCS / VO	4
21-	*Osteocephalus castaneicola* Moravec *et al.*, 2009	UF	TCS	1
22-	*Osteocephalus taurinus* Steindachner, 1862	FF	TCS	2
23-	*Phyllomedusa bicolor* (Boddaert, 1772)	FF / UF	VO	-
24-	*Phyllomedusa palliata* Peters, 1873	UF	TCS	1
25-	*Scarthyla goinorum* (Bokermann, 1962)	FF	TCS	3
26-	*Scinax boesemani* (Goin, 1966)	A	TCS	1
27-	*Scinax garbei* (Miranda-Ribeiro, 1926)	FF	TCS	2
28-	*Scinax* cf. *nebulosus* (Spix, 1824)	UF	TCS	1
29-	*Scinax ruber* (Laurenti, 1768)	A	AS / TCS / VO	4
	Leiuperidae			
30-	*Edalorhina perezi* Jiménez de la Espada, 1871	A / UF	PT	3
31-	*Engystomops freibergi* (Donoso-Barros, 1969)	A / UF	PT	4
	Leptodactylidae			
32-	*Leptodactylus andreae* (Müller, 1923)	A	TCS / PT	3
33-	*Leptodactylus hylaedactylus* (Boulenger, 1882)	UF	PT	1
34-	*Leptodactylus pentadactylus* (Laurenti, 1768)	UF	CO	1
35-	*Leptodactylus petersii* (Steindachner, 1864)	A / IG	TCS / PT	8
36-	*Leptodactylus rhodomystax* Boulenger, 1884	UF	TCS / PT	7
	Microhylidae			
37-	*Chiasmocleis bassleri* Dunn, 1949	UF	PT	6
38-	*Chiasmocleis ventrimaculata* (Andersson, 1945)	UF	PT	1
39-	*Hamptophryne boliviana* (Parker, 1927)	UF	PT	2
	Pipidae			
40-	*Pipa pipa* (Linnaeus, 1758)	FF	PT	1
	Strabomantidae			
41-	*Oreobates quixensis* (Jiménez de la Espada, 1872)	A / FF	TCS / PT	4
42-	*Pristimantis fenestratus* (Steindachner, 1864)	MS / FF	AS / TCS	5
43-	*Pristimantis ockendeni* (Boulenger, 1912)	UF	TCS	3
44-	*Pristimantis* sp. 1	UF	PT	2
45-	*Pristimantis* sp. 2	FF	PT	1

Table 1. *Continued.*

	TAXON	HABITAT	METHOD	N
	Gymnophiona			
	Caeciliidae			
46-	*Caecilia* sp.	UF	AS	1
	Reptilia			
	Squamata			
	Amphisbaenidae			
47-	*Amphisbaena fuliginosa* Linnaeus, 1758	A	AS	1
	Gymnophthalmidae			
48-	*Alopoglossus angulatus* (Linnaeus, 1758)	FF / UF	PT	6
49-	*Arthrosaura reticulata* (O´Shaughnessy, 1881)	FF / UF	PT	2
50-	*Bachia flavescens* (Bonnaterre, 1789)	FF / UF	PT	1
51-	*Bachia peruana* (Werner, 1901)	FF / UF	PT	2
	Iguanidae			
52-	*Iguana iguana* (Linnaeus, 1758)	A / MS	AS / TCS	2
	Polychrotidae			
53-	*Anolis fuscoauratus* D´Orbigny, 1837	FF	TCS	1
54-	*Anolis nitens nitens* (Wagler, 1830)	UF	TCS	1
55-	*Anolis nitens tandai* Avila-Pires, 1995	UF	CO	1
56-	*Anolis trachyderma* Cope, 1876	FF / UF	TCS	8
	Tropiduridae			
57-	*Plica umbra* (Linnaeus, 1758)	UF	PT	1
	Sphaerodactylidae			
58-	*Gonatodes humeralis* (Guichenot, 1855)	MS / MR / FF	AS	4
59-	*Gonatodes hasemani* Griffin, 1917	A	TCS / PT	3
60-	*Pseudogonatodes* sp.	FF	PT	
	Teiidae			
61-	*Ameiva ameiva* (Linnaeus, 1758)	A	TCS / CO	4
62-	*Kentropyx altamazonica* (Cope, 1876)	A / MS	TCS / CO	4
	Boidae			
63-	*Boa constrictor* (Linnaeus, 1758)	-	CO	1
64-	*Corallus hortulanus* (Linnaeus, 1758)	A / FF	CO / AS / TCS	3
65-	*Eunectes murinus* (Linnaeus, 1758)	-	CO	-
	Colubridae			
66-	*Chironius multiventris* Schmidt and Walker, 1943	A / UF	CO / TCS	2
67-	*Drymoluber dichrous* (Peters, 1863)	MS	TCS	1
	Dipsadidae			
68-	*Dipsas catesbyi* (Sentzen, 1796)	FF	TCS	1
69-	*Helicops angulatus* (Linnaeus, 1758)	MR	AS	1
70-	*Imantodes cenchoa* (Linnaeus, 1758)	FF	CO / TCS	2
71-	*Liophis dorsocorallinus* Esqueda, Natera, La Marca and Ilija-Fistar, 2005	A / FF	CO / TCS	2
72-	*Philodryas argentea* (Daudin, 1803)	UF	CO	1
73-	*Siphlophis compressus* (Daudin, 1803)	FF	TCS	1
74-	*Thamnodynastes pallidus* (Linnaeus, 1758)	A	TCS	1
	Elapidae			
75-	*Micrurus lemniscatus* (Linnaeus, 1758)	FF	TCS / PT	2
76-	*Micrurus spixii* Wagler, 1824	RC	AS	1
77-	*Micrurus surinamensis* (Cuvier, 1817)	FF	TCS	1
	Viperidae			
78-	*Bothriopsis bilineata* (Wied, 1825)	FF	TCS	1
79-	*Bothrops atrox* (Linnaeus, 1758)	A	AS / CO	3
80-	*Lachesis muta* (Linnaeus, 1766)	UF	CO	1
	Crocodylia			
	Alligatoridae			
81-	*Caiman crocodilus* (Linnaeus, 1758)	IG	TCS	-
82-	*Melanosuchus niger* (Spix, 1825)	RC	CO	-
	Testudines			
	Podocnemididae			
83-	*Podocnemis unifilis* Troschel, 1848	RC	CO	-
	Testudinidae			
84-	*Chelonoidis* sp.	-	CO	-

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Appendix 1A. Some amphibians recorded at RESEX do Rio Gregório, municipalities of Eirunepé and Ipixuna, state of Amazonas, Brazil. A) *Rhinella margaritifera*, B) *Pristimantis ockendeni*, C) *Ameerega trivittata*, D) *Leptodactylus petersii*, E) *Rhinella marina*, F) *Rhaebo guttatus*, G) *Ameerega hahneli*, and H) *Leptodactylus rhodomystax*. Credits: Davi L. Pantoja.

Appendix 1B. Some amphibians recorded at RESEX do Rio Gregório, municipalities of Eirunepé and Ipixuna, state of Amazonas, Brazil. A) *Hypsiboas fasciatus*, B) *Scinax boesemani*, C) *Phyllomedusa palliata*, D) *Hypsiboas wavrini*, E) *Hypsiboas punctatus*, F) *Scarthyla goinorum*, G) *Scinax garbei*, and H) *Hypsiboas lanciformis*. Credits: Davi L. Pantoja.

Appendix 2. Some lizards recorded at RESEX do Rio Gregório, municipalities of Eirunepé and Ipixuna, state of Amazonas, Brazil. A) *Kentropyx altamazonica*, B) *Anolis trachyderma*, C) *Gonatodes humeralis*, D) *Iguana iguana*, E) *Ameiva ameiva*, F) *Anolis nitens tandai*, G) *Anolis nitens nitens*, and H) *Plica umbra*. Credits: Davi L. Pantoja.

Appendix 3A. Some snakes recorded at RESEX do Rio Gregório, municipalities of Eirunepé and Ipixuna, state of Amazonas, Brazil. A) *Bothriopsis bilineata*, B) *Micrurus spixii*, C) *Micrurus lemniscatus*, D) *Philodryas argentea*, E) *Bothrops atrox*, F) *Micrurus surinamensis*, G) *Liophis dorsocorallinus*, and H) *Helicops angulatus*. Credits: Davi L. Pantoja.

Appendix 3B. Some snakes recorded at RESEX do Rio Gregório, municipalities of Eirunepé and Ipixuna, state of Amazonas, Brazil. A) *Thamnodynastes pallidus*, B) *Chironius multiventris*, C) *Corallus hortulanus*, D) *Dipsas catesbyi*, E) *Drymoluber dichrous*, and F) *Corallus hortulanus*. Credits: Davi L. Pantoja.

Appendix 4. Some herps recorded exclusively by pitfall traps at RESEX do Rio Gregório, municipalities of Eirunepé and Ipixuna, state of Amazonas, Brazil. A) *Alopoglossus angulatus*, B) *Pseudogonatodes* sp., C) *Chiasmocleis bassleri*, D) *Engystomops freibergi*, E) *Bachia peruana*, F) *Allobates* sp., G) *Leptodactylus hylaedactylus*, and H) *Hamptophryne boliviana*. Credits: Davi L. Pantoja.